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NATIONAL INTELLIGENCE ESTIMATE

THE PROBABILITY OF SOVIET EMPLOYMENT OF BW AND CW IN THE EVENT OF ATTACKS UPON THE US

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NATIONAL INTELLIGENCE ESTIMATE

THE PROBABILITY OF SOVIET EMPLOYMENT OF BW AND CW IN THE EVENT OF ATTACKS UPON THE US

NIE-18

This estimate has been prepared at the request of NSRB for guidance in civil defense planning and is based on information available on 15 December 1950. The intelligence organizations of the Departments of State, the Army, the Navy, and the Air Force participated in the preparation of this estimate and concur in it.

THE PROBABILITY OF SOVIET EMPLOYMENT OF BW AND CW IN THE EVENT OF ATTACKS UPON THE US

1. THE PROBLEM

1.1 At the request of NSRB, to estimate for the period 1951-1954:

1.11 The capability of the USSR for biological warfare (BW) and chemical warfare (CW) attacks upon the US, and

1.12 The probability that the USSR will employ BW or CW in the event of an attack upon the US.

2. CAPABILITIES FOR BW ATTACK ON THE US

2.1 BW AGENTS AVAILABLE TO USSR FOR ATTACK ON THE US.

2.11 It is highly probable that the Soviets are carrying on an extensive program to develop BW agents and equipment, and they appear to have given some attention to the possible use of BW agents for sabotage activities.

2.12 On the basis of available information on Soviet interest and activities in BW, Soviet scientific and technical potential, and US experience in development of BW, it is estimated that:

2.121 At present, the Soviets are capable of producing a variety of agents in sufficient quantities for sabotage or small-scale employment.

2.122 By 1952 at the latest, the Soviets probably will be capable of mass production of BW agents for large-scale employment.

2.123 The Soviets would most likely develop and produce for employment against the United States one or more of the BW agents listed in App. A. Data on the characteristics of the agents and possible targets are also included in App. A.

2.2 SABOTAGE ATTACK.

2.21 BW is well suited for sabotage employment against personnel, livestock, and crops.

2.211 Sabotage does not necessarily require the techniques and equipment prerequisite to large-scale military dissemination.

2.212 Some biological agents can reproduce themselves. The equipment necessary for cultivating many bacteria is usually available in any small laboratory or can be improvised readily in the average kitchen. Therefore, certain biological agents need not be introduced into the United States continually. Detection of the minute initial quantity required is impossible.

2.213 A trained bacteriologist could procure and culture effective BW agents locally. Hence, it would not be necessary to in-

troduce biological materials into the United States.

2.214 Sabotage employment of biological weapons during periods of nominal peace is facilitated by the resemblance of the results of such sabotage to natural occurrences.

2.22 The USSR is considered to be capable of sabotage employment of biological weapons against personnel, plants, and animals. The technical qualifications required for a saboteur are not great, and it must be assumed that the Soviets have personnel who are technically qualified for BW sabotage.

2.23 Possible methods of introducing and disseminating biological weapons are almost limitless. The following are examples:

2.231 BW agents that withstand drying could be smeared on cloth, leather, etc., or perhaps under the postage stamp of a letter. Agents which cannot persist in this form could be preserved in tubes small enough to be concealed in clothing, letters, or a cigarette.

2.232 The initial material need not be in the form of a culture. Infected animals, birds, or insects might be released to spread the disease.

2.233 BW agents may be disguised as cosmetics in personal baggage.

2.234 Contaminated letters may be sent directly to the intended victims, without risk of detection.

2.235 The contents of a quart thermos bottle introduced into the air-conditioning system of a large office building could produce infection in the majority of the personnel, within 4 hours to 30 days, depending on the agent.

2.3 MILITARY ATTACK.

2.31 Two of the principal aspects which govern the capability of the Soviet Union for military attack with BW agents are delivery to the target and dissemination on the target.

2.32 During the period 1951-1954, the Soviet Union will be capable of delivering BW agents to the United States by long range aircraft or submarines. (The detailed discussion of the methods of delivery in App. C in connection with CW is generally applicable also to BW.) However, it is estimated that the quantities of BW agents required to support military attack on a large scale will not be available to the Soviets before 1952 (see par. 2.122 above).

2.33 There are indications that the Soviets are experimenting with various devices for disseminating BW agents. Although it is difficult to devise weapons that produce optimum dispersal, a device that effectively spreads at least a small portion of the BW filler can prove adequate. Therefore, it is estimated that the Soviets can have adequate weapons for disseminating the BW agents available to them. These can include cluster bombs, aerosol devices, and projectiles.

3. CAPABILITIES FOR CW ATTACK ON THE US

3.1 CW AGENTS AVAILABLE TO USSR FOR CW ATTACK ON THE US.

3.11 The term CW agents as used herein refers to those toxic chemical agents suitable for employment in mass quantities for conventional chemical warfare. These agents are to be contrasted with the almost countless number of poisonous chemical compounds which are readily available from commercial sources in the United States for employment by Soviet agents for contaminating food and water supplies and for poisoning key individuals.

3.12 It is known that the Soviets have large stockpiles of standard CW agents as well as the necessary production facilities. However, it is considered improbable that these agents would be employed in an attack on the US. If the Soviets employ CW against the US, it is believed that nerve gases will be used. The nerve gases are considerably more toxic than standard CW agents and the quantity required for comparable effectiveness is many times less.

3.13 At the close of the war, the Soviets obtained a quantity of German GA nerve gas. In addition, the Soviets obtained the only German full-scale plant for the production of GA. This plant had a rated capacity of 1000 tons per month. They also obtained the German pilot plant for the production of GB nerve gas and a full-scale plant. The latter was partially completed and was to have a rated capacity of 500 tons per month. These production facilities and a number of the German specialized personnel were removed to the Soviet Union. The available intelligence suggests that the Soviets have been producing at least one of the nerve gases since 1949. Hence, it is estimated that:

3.131 At present, the Soviets probably have available sufficient nerve gas for a mass lethal attack on a number of US cities.

3.132 By 1952, the Soviets will have available sufficient nerve gas for sustained extensive employment.

3.14 Data on the characteristics of GA and GB nerve gases and possible targets are indicated in App. B.

3.15 There is insufficient information concerning Soviet CW research and development to permit a definite estimate of additional agents which may become available by 1954. However, the available intelligence pertaining to scientific competence and to the potential of the chemical industry in the Soviet Union necessitates the assumption that the Soviets have adequate technical skill and capacity for developing and producing CW agents. Therefore, by 1954 the Soviets may have available new agents in sufficient quantity for limited mass lethal attack on selected military or industrial targets in the US. These agents could be several times more toxic than the present nerve gases and substantially less quantity would be required for comparable effectiveness.

3.2 SABOTAGE ATTACK.

3.21 In view of the small quantities required, G-series nerve gases are well suited for sabotage attack against personnel in key installations where immediate incapacitation of a high percentage of the personnel is desired. However, the characteristic physiological effects of the nerve gases make their detection and identification as enemy action relatively easy. Therefore, the nerve gases are not suited for sabotage attack prior to D-Day.

3.22 The Soviet Union is capable of attempting to smuggle nerve gas into the United States in the relatively small quantities required for sabotage attack.

3.221 Since the agents are odorless, colorless liquids, they can be transported in glass or suitably lined containers. Hence, the agent could be shipped in any desired quantity disguised as innocuous liquids, such as champagne or perfume.

3.222 As indicated in App. B, nerve gas becomes an effective personnel weapon when dispersed as a fog or an invisible vapor. For sabotage attack, this is best accomplished by an aerosol bomb, such as those used for insecticides. Therefore, as an alternative to shipment of agents disguised as harmless

liquids, the Soviets might choose to ship completed aerosol bombs. This could be done under the cover of diplomatic immunity or as aerosol bombs labeled as insecticides.

3.3 MILITARY ATTACK.

3.31 During the period 1951-1954, the Soviet Union will be capable of delivering CW agents to the United States by long range aircraft or submarines. This capability is discussed in detail in App. C.

3.32 It is considered that the Soviet Union has reasonably efficient means for accomplishing the dissemination of available CW agents.

4. PROBABILITY THAT THE USSR WILL USE BW AND CW AGENTS IN THE EVENT OF AN ATTACK ON THE UNITED STATES

4.1 In the event the Soviets attack the United States, they may well strike with maximum surprise and effectiveness in order to cripple our retaliatory forces, our principal mobilization and communications centers, and specific critical industries. To this end, they will undoubtedly consider employment of all the atomic, biological, and chemical weapons available to them.*

4.2 Both sabotage and surprise military attack with atomic, biological and chemical weapons offer a high potential of effectiveness, particularly when employed concurrently with or just prior to the initiation of a full-scale war. Many methods of delivery could be used prior to D-day. However, detection and identification as enemy action of such pre-D-day delivery would cost the Soviets complete loss of strategic surprise. On the other hand, detection of clandestine introduction of atomic weapons into key harbors is extremely difficult, as is the identification of certain types of biological warfare. Nevertheless, it can be assumed that any attack with weapons of mass destruction upon the US would be synchronized with Soviet over-all war plans and, with the possible exception of sabotage attack with BW agents, would be undertaken only after the Soivets had decided they were prepared to become involved in full-scale war against the United States.

4.3 In an attack on the US, it is likely that the Soviets will employ their atomic bomb stockpile to the fullest extent consistent with the over-all strategic situation. Based on present estimates of BW and CW potential, the problems of effective dissemination and the fact that BW and the nerve gases are untried weapons, it is estimated that the Soviets would probably employ a large scale military attack with BW or CW only as a supplement to their atomic capabilities. However, scientific and technological developments during the next few years may further increase the decisive potential of these weapons.

4.4 The Soviet decision to employ BW or CW against the United States may be influenced to some extent by their fear of effective retaliation in kind by the United States and by their appraisal of our defensive capabilities against both sabotage and military attack. Without attempting to evaluate the operational significance of our retaliatory and defensive capabilities, and in the absence of definite indications of Soviet intentions to employ BW or CW, it is estimated that:

4.41 Sabotage attacks with BW agents may be employed by the Soviets at

* The USSR has the basic facilities available for the production of radiological warfare (RW) materials. Large scale production of these materials will seriously compete with production of fissionable material for atomic bombs. It is most improbable that the Soviet effort will be diverted from production of atomic bombs. By comparison with BW and CW agents, the employment of RW agents for sabotage attack is very disadvantageous, and their use in this connection is therefore improbable.

any time, even well in advance of D-day, as part of an over-all plan to deter the military effectiveness of the US. This includes attacks against crops and livestock over a relatively long period of time with the objective of producing significant economic losses.

4.42 Subsequent to D-day, widespread sabotage attacks with BW agents may well be employed against personnel, crops, and livestock.

4.43 It is unlikely that the Soviets will attempt sabotage employment of CW agents prior to D-day due to the ease of identification of such employment and the consequent loss of strategic surprise.

4.44 Coincident with overt military attack, as well as subsequently, sabotage employment of CW agents may possibly be employed against personnel in key installations.

4.45 As BW agents become available to the Soviets in sufficient quantities, military attack with BW may be employed to supplement AW and CW attacks against population centers. Military attack against crops and livestock is likely to be limited to small-scale, isolated attacks with self-propagating agents which may have widespread effects.

4.46 Military attack with CW agents may be employed by the Soviets to supplement their atomic capabilities.

4.47 Unless there is significant increase in the decisiveness of BW and CW military employment of these weapons is more likely during that period when the Soviet atomic bomb stockpile is relatively limited.

APPENDIX A

BW AGENTS

1. CHARACTERISTICS.
   1.1 It is estimated that the Soviets would most likely develop and produce for employment against the US one or more of the BW agents listed in Table I. These agents have been selected on the basis of the following considerations:
      1.11 The known characteristics of disease-producing micro-organisms and their toxic products in the light of probable military requirements.
      1.12 US experience in selection and development of BW agents.
      1.13 Ease of production, stockpiling, delivery and dissemination.
      1.14 Susceptibility of US personnel, crops, and livestock and resulting probability of effectiveness.
      1.15 Evidence of Soviet knowledge and interest.
   1.2 Among the micro-organisms and toxins that meet the broad requirements of a BW agent, effects vary widely. Some act rapidly, while others have a long incubation period. The results include temporary incapacitation, prolonged disability or a high percentage of fatality. If the BW agent and method of dissemination are carefully chosen, naturally occurring disease may be simulated so closely that deliberate employment of BW cannot be proved.
   1.3 If sabotage attack is employed prior to the outbreak of open hostilities, the Soviets would most likely use BW agents that produce diseases normally expected to occur in the US. For example, US livestock is notoriously vulnerable to foot and mouth disease and rinderpest. However, after open hostilities, the Soviets might use agents that would produce new or unusual diseases. Detection and identification might be difficult and time-consuming and the problem of defense may not be solved with the identification of the agent.
2. BW TARGETS.
   2.1 PERSONNEL TARGETS.
      2.11 BW attacks upon population centers would probably be undertaken by large-scale contamination of the air or by contamination of the water supply. In addition to casualties, the objective would be the psychological effect and the confusion resulting from overtaxing the medical facilities.
      2.12 BW is well suited for sabotage attack against key personnel. The Pentagon has been proved vulnerable to such attack in tests with simulated agents. Other critical installations, such as Strategic Air Command bases, are also vulnerable to BW agents introduced into air, water, or food supplies. Industries employing chiefly unskilled labor would be less suitable targets than industries requiring a longer period of training to develop special skills. Attacks upon key communications and transportation facilities would be particularly injurious.
   2.2 ANIMAL TARGETS. BW attack on animals would be directed primarily at the food supply. Cattle could be attacked in shipping centers, stockyards, and other concentration areas. Hogs also are an important target; sheep and poultry would be somewhat less significant.
   2.3 PLANT TARGETS. Food crops would be a primary target, but attack might also be directed against crops that are the source of important industrial oils or

textile fibres. Chemical growth regulators being persistent for several months could be used to render the soil unsuitable for certain types of crops. If cereal rusts are employed, local winds would be utilized to spread the infection.

3. REFERENCES. Additional data of possible value for civil defense planning is contained in the following:

3.1 Biological Warfare. Presentation to the Secretary of Defense's Ad Hoc Committee on CEBAR by Office of the Chief, Chemical Corps, 24 February 1950.

3.2 Report of the Secretary of Defense's Ad Hoc Committee on Chemical, Biological and Radiological Warfare, 30 June 1950.

3.3 Reports on the vulnerability of the Pentagon to attack by BW agents, prepared by the Biological Department, Chemical Corps, Camp Detrick, Frederick, Maryland:

3.31 Special Report No. 117, 12 October 1950.

3.32 Special Report No. 131, 6 March 1950.

3.33 Special Report No. 132, 18 April 1950.

TABLE I

BW AGENTS LIKELY TO BE USED AGAINST THE UNITED STATES BY THE USSR*

A. ANTI-PERSONNEL AGENTS

AGENT	DISEASE PRODUCED	INCUBATION PERIOD**	PERCENT FATALITY**	PERIOD OF DISABILITY**	CHARACTERISTICS**
Bacillus anthracis	Anthrax	1–7 days	10–100	1–5 days in fatal cases	Low infectivity; persistent; not transmissible man to man
Toxin of *Clostridium botulinum*	Botulism	Usually under 24 hours	15–90	3–7 days in fatal cases; 2–4 months non-fatal	Three types toxic to man; not transmissible; most powerful toxin known
Brucella species	Brucellosis	10–60 days	4–6	Up to 2–3 months	Moderately persistent; not transmissible man to man
Coccidioides imitis	Coccidiomycosis	8–14 days	Variable	3–6 weeks in acute cases; longer in chronic cases	Probably highly persistent
Staphylococcus toxin	Food poisoning	1–4 hours	None	Seldom over 24 hours	Toxin not destroyed by cooking; sabotage use indicated
Malleomyces mallei	Glanders	1–20 days	50–100	7–10 days in fatal cases; months or years in chronic cases	Moderately persistent
Psittacosis virus	Parrot fever	1–2 weeks	20	Several weeks	Highly contagious
Pasteurella pestis	Plague	2–10 days	25–75	3–7 days in fatal cases	Moderately persistent; pneumonic type highly contagious
Coxiella burnetii	Q fever	Not more than 15 days	None	7–24 days	
Pasteurella tularensis	Tularemia	1–10 days	5–11	2–60 weeks	Persistent for several days; not transmissible to man

* No priority is indicated by order of mention. Other diseases whose agents are less likely to be used are: dysentery (bacillary and amebic) and other enteric diseases, including cholera, typhoid, and paratyphoid; influenza; virus encephalitides; typhus.

** All data refer to natural cases of these diseases; presumably the characteristic of diseases induced by BW would be much the same.

*B. ANTI-ANIMAL AGENTS**

AGENT	DISEASE PRODUCED	PRINCIPAL ANIMAL HOSTS	INCUBATION PERIOD	PERCENT FATALITY, ETC.	CHARACTERISTICS
Bacillus anthracis	Anthrax	Cattle, sheep (almost all mammals susceptible)	1–2 days	70–80; usually in 1–5 days	Applied wet, in food or as dried spore dust; extremely persistent
A virus	Foot and mouth disease	Cloven-hoofed animals (cattle, hogs, sheep)	2–14 days	2–70; recovered animals show loss of weight and milk production	Highly resistant virus, persisting several days, possibly longer; disease highly contagious; several serological types
A virus	Fowl plague	Chickens, turkeys and other birds	3–7 days	1–100	Fairly resistant virus; disease highly contagious
A virus	Rinderpest	Cattle, sheep; and goats less often	2–9 days	15–100; usually in 10–11 days	Highly contagious; persists at least 5 days

* Other diseases, whose agents are less likely to be used, are: hog cholera; Newcastle disease; disease produced by the toxin of *Stachybotrys alternans;* Venezuelan equine encephalomyelitis.

*C. ANTI-CROP AGENTS**

AGENT	POTENTIAL EFFECTS	CHARACTERISTICS
Puccinia graminis and other species causing cereal rusts	Fungus disease attacking all small grains (wheat, rye, barley, oats). A severe epiphytotic may reduce both winter and spring wheat crops by at least 50%.	Dried spore dust, resistant to environmental conditions. Effective dissemination requires only 1/10 gram per acre.
Chemical growth regulators	Complete or partial destruction of the crop depending on quantity of agent used and degree of coverage. Plant reaction to agent is usually slow requiring days or weeks for total destruction.	Synthetic organic compounds of considerable selectivity in relation to effects on crops. One group of compounds (phenoxy) primarily effective on broad leaf plants (potatoes, sugar beets, cotton, etc.); another group (carbamate) primarily effective on small grain cereals (wheat, rye, barley, oats). Broad leaf plants can be destroyed with 1/10 lb. of agent per acre, while cereal destruction would require 1 to 5 lbs. per acre.

* Other diseases, whose agents are less likely to be used, are: late blight of potatoes, golden nematode infestation of potatoes.

APPENDIX B

GA AND GB NERVE GASES

1. GENERAL. GA and GB are colorless, odorless, low viscosity liquids, somewhat more volatile than kerosene. They become effective anti-personnel agents when dispersed as a vapor or invisible fog. GB is approximately 2½ times more toxic than GA.

2. QUANTITIES REQUIRED FOR EFFECTIVE EMPLOYMENT.

2.1 MILITARY ATTACK.

2.11 Approximately 5 tons of GB used in present munitions would be required to obtain a concentration for 50% lethality, in an open area of one square mile, under favorable weather conditions as described in paragraph 2.14 below. Theoretically, some 2½ times more GA would be required for comparable effectiveness. However, dissemination of GA by munitions to date does not approach this ideal and 15 to 20 times more GA than GB may be needed for 50% lethality.

2.12 The quantities of GA and GB delivered on the target in a military attack may well be sub-lethal. However, even with as little as 1/10 of the lethal quantity, effective incapacitation and demoralization can be obtained.

2.13 Inasmuch as the nerve gases are anti-personnel weapons they would be employed against population centers and military and industrial installations where the objective is primarily incapacitation of personnel as contrasted with physical destruction. However, CW may also be employed to supplement AW and high explosives.

2.14 Effective dissemination of GA and GB against the foregoing targets requires the following conditions.

2.141 Low or medium wind velocity.

2.142 Shallow layer of cool air below a warm layer.

2.143 Openings in the buildings through which outside air can penetrate, such as windows or air conditioning inlet ducts (openings can be obtained by employing high explosive munitions concurrently with CW agents).

2.15 The atmospheric conditions usually present on many cloudy days and at times when inversion is present are suitable for a gas attack. Night conditions in times of fair weather are generally more favorable for a CW attack than day conditions. Sunny, hot days in summer time with little or no wind are unsuitable and the use of toxic agent clouds at these times would be inefficient.

2.2 SABOTAGE ATTACK.

2.21 When effectively disseminated throughout a confined space of 100,000 cubic feet, about one ounce of GA or about one-half ounce of GB are sufficient to incapacitate or kill substantially all of the people in the area. The most likely method of dissemination would be by means of an aerosol bomb type container similar to those used for insecticides. These bombs operate with an auxiliary volatile liquid, which together with the weight of the container would make the weight of the dispenser about five times the weight of the agent; that is, for 100,000 cubic feet the dispenser would weigh about ¼ pound.

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2.22 In the case of the Pentagon, which has 75,000,000 cubic feet of enclosed space, 50 lbs of GA or 20 lbs of GB would have to be dispersed throughout the building to cause the above results, assuming no significant extraction by the air conditioning system. This would require 50–10 pound bombs of about 0.6 gallon capacity for GA. Fewer bombs or smaller ones in the ration of 2–½ to 1 would be needed for GB.

3. EFFECTS PRODUCED AND PROTECTIVE MEASURES.

3.1 GA and GB produce characteristic physiological effects, such as, contraction of the pupil of the eye, twitching eyelids, tightness of the chest, difficulty in breathing, blurring of vision, twitching of muscles, headache, nausea, vomiting, salivation and diarrhea. In the case of a lethal dose, the victim loses muscular power and coordination. In addition to intensification of the foregoing effects, convulsions occur and there is involuntary defecation and urination; distressed breathing; paralysis; unconsciousness; heart slowing, dilating and eventually stopping due to heart muscle failure and asphyxia. In general, death occurs within an hour after exposure to the lethal concentration.

3.2 The physiological effects are greatest when absorbed through the respiratory system following inhalation of the vapors. However, the same effects can be produced by larger doses through mucous membranes, open wounds, and even by a small drop of the liquid touching the skin. The liquid will penetrate ordinary clothing.

3.3 Theoretically, complete protection against the nerve gases requires not only a well fitted gas mask but also special impermeable clothing. However, except in the immediate vicinity of bursts, the concentrations which probably will be encountered will be such that gas masks will provide adequate protection for all but a few of the personnel in the target area. On the other hand, at present there is no quick method of detection of GA and GB for warning and identification.

3.4 GA and GB are easily decomposed by any acid and they hydrolyze very rapidly in alkaline solutions. Effective decontamination can be carried out with alcohol solutions of sodium and potassium hydroxide, and solutions or pastes of washing soda, lime bleach, and baking soda. Even scrubbing with soap and water is effective to a degree.

3.5 Immediate injection of atropine is extremely effective in counteracting the physiological effects of these gases.

4. REFERENCES.

Additional information which may be of assistance to civil defense planning will be found in the following:

4.1 Presentation to the Secretary of Defense's Ad Hoc Committee on CEBAR 27 January 1950. Submitted by Office of Chief, Chemical Corps.

4.2 Report of the Ad Hoc Committee on BW, CW, and RW (Stephenson Committee) to the Secretary of Defense, 30 June 1950.

4.3 Summary Technical Report of NDRC Division 9, Volume 1, Parts I & II and Division 10, Volume I, Part II.

4.4 Chemical and Toxicologic Data on CW Agents by E. L. Wardell and C. A. Rouiller, Information Branch, Technical Service Division, Office of the Chief, Chemical Corps, 25 May 1948.

APPENDIX C

CAPABILITY OF THE USSR TO DELIVER CW AGENTS IN A MILITARY ATTACK AGAINST THE US

1. GENERAL. The Soviet Union has the capability of attempting the delivery of CW agents to the United States by long range air attack or from submarines in coastal waters opposite key US ports.

2. LONG RANGE AIRCRAFT. The Soviet Union has and will have sufficient long range aircraft, trained crews, and bases of operation to enable it to attempt to deliver sizeable CW attacks against targets in the US.

   2.1 It is estimated that the Soviet Union will not be able to employ heavy bombers on conventional two-way missions against the entire United States before 1953. When available, these aircraft could deliver approximately four to six tons of CW agents, depending upon the length of the intercontinental mission assigned.

   2.2 Prior to 1953, the USSR can use TU–4 aircraft to attack the northwest US (State of Washington) on two-way missions. However, with refueling techniques and/or one-way missions, attacks can be attempted against all vital targets in the US. While there is no evidence that the Soviet Union has developed a refueling technique, US experience indicates there are no significant difficulties involved. Employment of single point refueling would increase the combat radius of the TU–4 to approximately 3,360 nautical miles (40 per cent increase). The TU–4 is a four-engined, medium bomber comparable to the US B–29. This aircraft would carry a payload of approximately five (5) tons in bombs with an estimated three tons of nerve gas filler.

   2.3 It is estimated that Soviet Long Range Air Force has approximately 500 TU–4 aircraft. This number of TU–4's will increase to an estimated 900 by mid-1951 and 1,200 by mid-1952. Therefore, the Soviet Union can employ or expend a number of TU–4's to attempt CW attacks against the US without reducing its capability to deliver its available stockpile of atomic bombs.

   2.4 World War II operations of the Soviet bomber units were handicapped by poor navigation and by lack of skill in instrument and high altitude flying. It is known that units of the Long Range Air Force are undergoing concentrated and progressive training to overcome these World War II weaknesses and to increase their capabilities for long range attack. The average Soviet medium bomber crew is still considered to be less skilled than the average US four-engined bomber crew. However, because of the large amount of target, weather, and US defense information available to the Soviet Union, barring interception, attacking Soviet aircraft should be capable of locating and accurately identifying selected targets. Should local conditions require the dropping of bombs by other than visual means, efficiency of bomb placement may be adversely affected.

3. GUIDED MISSILES.

   3.1 It is estimated the Soviet Union will not be capable of delivery of CW agents against targets in the US using long range, intercontinental, surface-to-surface guided missiles by 1954.

   3.2 The use of V–1 type missiles in air-to-surface missions in conjunction with medium and heavy bombers is theoretically feasible, but would probably produce less accurate attack, less effective dissemination, and a decrease in the quantity of agent delivered by each aircraft.

3.3 V–1 type missiles with CW warheads could be employed against coastal cities by limited numbers of submarines (or disguised surface craft). (See paragraph 4.4, immediately following.)

4. ATTACK FROM SURFACED SUBMARINES. The Soviet Union is capable of employing long and medium range submarines to deliver CW agents against key cities on the East and West coast of the United States. However, the attacks would be of comparatively small scale and harassing in nature.

4.1 In 1951, the Soviet Union will have an estimated 117 long range submarines and 63 medium range submarines from which to draw for such attack. By 1954, this fleet will increase to an estimated 150 long range submarines and 90 medium range submarines. The medium range submarines would require mid-ocean refueling, but this imposes no insurmountable limitation.

4.2 All of these submarines, except approximately twenty of the latest high speed, long range type, could launch brief attacks using the medium caliber, deck gun to fire shells with CW agent filler. They could surface and hastily fire, for example, fifty 30-pound projectiles (normally 3.9″ caliber), each containing about six pounds of agent, from probable ranges of 5,000 to 8,000 yards. However, it is considered likely that in such a small scale attack, conventional high explosive ammunition would create as much, if not more, panic and damage.

4.3 Similarly, these submarines can be modified easily to surface and deliver within fifteen to thirty minutes, from ranges of 1,000 to 3,000 yards, up to approximately 1,000 pounds of agent using two or four deck-mounted heavy mortars (120 to 160 mm) or multiple, rail type, barrage rocket launchers and 13 or 30 cm rockets. It is considered such an attack would be effective only if confined to a target area of less than one-quarter of a square mile.

4.4 A portion of these submarines could be equipped to launch V–1 type, surface-to-surface, missiles from probable ranges of 30 to 130 miles. With deck modifications, a submarine could carry two to five V–1 type missiles, or with extensive design changes, eight to twelve missiles could be carried. At comparatively short ranges each missile could deliver approximately one ton of nerve gas and produce lethal results within a target area of one-quarter to one-half of a square mile. It is estimated that a submarine would have to be surfaced for approximately 30 minutes for each V–1 launched.

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